SUMMARY
of the Twenty-first Meeting of the Providers' Forum
held in conjunction with the Thirteenth Meeting of
the International Committee on Global Navigation Satellite Systems (ICG)
4 and 8 November 2018
Xi'an, China

The twenty-first meeting of the Providers' Forum, co-chaired by China and Japan, was held in conjunction with the thirteenth meeting of the International Committee on Global Navigation Satellite Systems (ICG), on 4 and 8 November 2018, in Xi'an, China. China, India, Japan, the Russian Federation, the United States and the European Union were represented at the meeting. In the opening remarks, the co-chairs welcomed the participants and expressed hope for a successful meeting.

Open Service Information Dissemination

The following presentations were provided:

(a) BDS-3 Featured Service

China presented BeiDou Navigation Satellite System (BDS-3) featured service. BDS-3 will provide two basic services, Regional Navigation Satellite Systems (RNSS) and Satellite-based Augmentation Systems (SBAS). In addition, BDS-3 will provide three featured services, international search and rescue (SAR) service, short message communication (SMC) service (regional and global), and precise point positioning (PPP) service.

BeiDou SAR service meets the international standard, and has a return link function, which provides a useful enhancement to SAR service. The B2b signal is used to broadcast confirmation messages and other messages associated with search and rescue to users. 3IGSO + 24MEO satellites have the return link function.

BDS-3 regional SMC service has a two-way link, including an uplink on L band, and a downlink on S band. It plays an important role in safety of life applications. BDS-3 also deploys SMC service globally through crosslinks.

As for PPP service, the precise information of multi-GNSS systems will be broadcast by 3 GEO satellites. The positioning accuracy is at decimeter level for lower dynamics scenario, and centimeter level for static scenario.

China proposes that SAR return link capabilities should become an international standard to enhance SAR service, and that SMC service can/could provide life safety service and enrich better methods of search and rescue. China also proposes that GNSS providers should discuss a universal template for PPP service.

The providers agreed to discuss SAR and PPP services at meetings of the Working Groups.

(b) Update on Space Service Volume

The United States presented updates to the Space Service Volume (SSV) effort by the National Aeronautics and Space Administration (NASA) and the ICG Working Group B (WG-B). Space-based uses of Global Positioning System (GPS) and other GNSS include real-time on-board navigation, earth sciences, launch vehicles range operations, attitude determination, and timing synchronization. WG-B is actively improving capabilities of GNSS use in the SSV through furthering compatibility and interoperability. Missions both inside (LEO to GEO) and beyond the SSV (GEO to lunar distance) can benefit from real-time navigation using GNSS.

Coordinated analyses from SSV observations are solidifying understanding on what missions can accomplish when GNSS constellations are used together. It is important for providers to specify SSV capabilities so that they are included in future builds of GNSS constellations. The priorities are for providers, space agencies and research institutions to support SSV capabilities through baselining of specifications, measuring and publishing antenna patterns to understand what can be accomplished, and to share user experiences and lessons learned to work together towards better

capabilities. The United States Air Force (USAF) and NASA signed a joint Memorandum of Understanding (MOU) to support SSV signal continuity goals for future space users that will employ the latest block build of GPS-III satellites.

The US team presented results of the Antenna Characterization Experiment (ACE), which provided the first reconstruction of the full GPS antenna gain patterns from flight observations. This supports the priority to measure and publish GNSS antenna gain patterns to support SSV understanding and use in mission simulations. Another important update pertaining to data collection is that an additional apogee raising maneuver is planned for the Magnetospheric Multi-Scale (MMS) mission in February of next year up to 29 Earth radii – representing half of lunar distance – will produce data for presentation at ICG-14.

Recent international outreach efforts include actively engaging in WG-B to publish the SSV booklet for ICG-13 and continuing work on the accompanying SSV video scheduled for release in Spring 2019. The United States is very interested in continuing international collaboration, including supporting the international team on outreach and panel sessions. Ongoing international activities include a NASA Lunar GPS visibility simulation, which demonstrates that current SSV-capable receivers can support navigation and timing at lunar distances, engagement in use of GNSS on-board the planned Lunar Orbital Platform-Gateway, and alignment with and support for the ISECG Exploration Roadmap.

(c) Identification and Distinction of GNSS Civil Liability

The providers took note of the presentation on "Identification and Distinction of GNSS Civil Liability" made by China.

Presentations by invited observers

The providers took note of the presentation on "Overviewing Australia's SBAS Programme" made by Australia, and the presentation on "Nigeria Satellite Augmentation System (NSAS) Role/Constructions to GNSS" made by Nigeria.

Service Performance Monitoring

It was noted by the co-chairs that this topic is being discussed in WG-S.

Spectrum Protection: Interference Detection and Mitigation

It was noted by the co-chairs that this topic is being discussed in WG-S.

Multi-GNSS Demonstration Project in the Asia/Oceania Region

Japan reported updates on Multi-GNSS Asia (MGA) activities that occurred in 2018. MGA is actively supporting capability building on GNSS utilization for the Asia Pacific region. It promotes GNSS technology by conducting webinars, lectures, and projects. Participants of the Providers' Forum were encouraged to contact the Japan Co-Chair if they are interested in being a resource for the webinars.

In 2018, MGA supported a summer school program for students and young researchers on GNSS, which was conducted at the Tokyo University of Marine Science and Technology. It also held the 10th MGA Conference in Melbourne, Australia in October which was attended by 200 participants from 20 countries. Major topics from the conference included the Australian Space Agency initiative on GNSS, updates on all GNSSs and RNSSs, an ITS panel discussion, Early Warning Service via GNSS, applications with smartphone raw measurements, and a young professional and student forum on the rapid prototype development project. The MGA Young Professional and Student Forum was an opportunity for interaction between students, research, and professionals. Networking events were held for the forum participants and industry representatives. In addition, 6 scholarships were provided by the Office for Outer Space Affairs.

MGA priorities for 2018 and 2019 include strengthening the user community towards an open innovation hub, aligning more closely with the ICG, transition the Secretariat responsibility, and encouraging a stronger role for local partners in the conference.

In 2019, MGA activities will include the 11th MGA conference, webinars and support of summer schools, and projects with demonstrations by young professionals. MGA is actively encouraging start-ups in the Asia Pacific Region. The 11th MGA conference will be held in Bangkok in May 2019 and being co-organized with startup events in the Asia Pacific region such as space business idea contest, "S-booster Asian Round" supported by Japanese government as well as "Startup Thailand".

ICG Information Centres: Regional Centres for Space Science and Technology Education (affiliated to the United Nations)

The ICG executive secretariat provided an overview of the activities carried out by the United Nations-affiliated Regional Centres for Space Science and Technology Education, acting as the ICG Information Centres. Participants of the Providers' Forum were invited to contribute to the work of the centres by providing educational materials and expertise.

Other Matters:

Review of the Providers' Forum Work Plan

The providers agreed to adopt changes to the work plan that were reviewed and discussed at the 20th meeting of the Providers' Forum held in June 2018 in Vienna.

The United States suggested including a reference to MEOSAR in the work plan, since it has been discussed at previous meetings of the Providers' Forum. The providers agreed to discuss this at the next meeting of the Providers' Forum with proposed language that would be adopted at ICG-

Statement of the Providers' Forum

GNSS offers civil Positioning, Navigation and Timing (PNT) services throughout the world on a continuous basis. These services are unique with respect to accuracy, availability, and coverage. As a result, GNSS is and is expected to remain a core element of existing and future PNT architectures for most nations.

The providers will continue to promote compatibility, interoperability, and transparency in civil service provision, and to support technological innovations in navigation satellite systems, taking into account their needs for land, sea, air and space applications, in order to contribute to domestic civil PNT architectures that fully meet their users' requirements. The providers will also continue their cooperation through the ICG and other international fora.

Request by Australia to Join the ICG as a Member.

Australia was invited to present details of their interest in membership to the providers. The Providers recommend that the ICG consider Australia's request for membership to the Committee.